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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/523,122

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Aiichirou Sasaki

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JOHN S. PRATT, ESQ
KILPATRICK STOCKTON, LLP
1100 PEACHTREE STREET
ATLANTA, GA 30309

EXAMINER

STULTZ, JESSICA T

ART UNIT

PAPER NUMBER

2873

MAIL DATE

DELIVERY MODE

06/25/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/523,122

Applicant(s)

SASAKI ET AL.

Examiner

Jessica T. Stultz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 April 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 and 12-27 is/are pending in the application.
- 4a) Of the above claim(s) 1-8, 26 and 27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 9, 10, 13 and 16-25 is/are rejected.
- 7) ☒ Claim(s) 12, 14 and 15 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 January 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 0607.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Examiner's Comments

For applicant's information, the amendment to claims 9 and 12 filed April 11, 2007 overcome the previous objection or 112 rejections of these claims, respectively.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 9 is rejected under 35 U.S.C. 102(b) as being anticipated by Kikuchi et al US 5,526,169, herein referred to as Kikuchi et al '169.

Regarding claim 9, Kikuchi et al '169 discloses an electro-optic modulation device that includes an electro-optic crystal having a birefringence index changed by a coupled electric field (Column 4, line 54-Column 6, line 39, wherein the electro-optic modulator comprises crystals "1" and "2", which change the polarization of a laser beam based on an applied electric field from signal "9" and thereby has a variable birefringence index, Figures 2-3), and one pair of electrodes disposed so as to have the electro-optic crystal interposed therebetween to couple the electric field to the electro-optic crystal (Column 5, line 26-Column 6, line 39, wherein the pair of electrodes comprise groove electrode "5" and electrode "3", which surround the crystal "1" as shown Figure 2), and that changes polarization of light incident between the one pair of electrodes according to a change of the birefringence index depending upon a strength of the electric field coupled via the one pair of electrodes (Column 4, line 54-Column 6, line 39,

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wherein the polarization of light incident upon face "b" changes based upon the electric field strength applied to the electrodes by signal source "9", Figures 2-3), the electro-optic modulation device comprising: a base portion having a top surface (Column 4, line 54-Column 6, line 39, wherein the base portion is the lower portion of electro-optic crystal "1" comprising a top surface defined by the lower portion of groove "8", Figures 2-3); and a ridge portion projecting from the top surface and extending in a direction of the incident light, at least a part of the ridge portion comprising the electro-optic crystal (Column 4, line 54-Column 6, line 39, wherein the ridge portion is the elevated portions of the crystal "1", Figures 2-3), the ridge portion having a width equivalent to a predetermined value or less (Column 4, line 54-Column 6, line 39, wherein the ridge portion has a width defined by the length of face "c", Figures 2-3), wherein the electrodes are formed on one pair of side faces opposed in a width direction of the ridge portion and on the whole top surface adjacent to the side faces (Column 5, line 26-Column 6, line 39, wherein the electrodes "5" and "3" are formed along opposing sides of the crystal "1" in a width direction and cover the exposed top surface of the base portion defined by the groove "8" as shown in Figures 2-3).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi et al '169 as applied to independent claim 9 above.

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Regarding claim 25, Kikuchi et al '169 discloses an electro-optic device as shown above wherein the ridge portion comprises electro-optic crystal (Column 4, line 54-Column 6, line 39, wherein the ridge portion comprises electro-optic crystal "1", Figures 2-3), wherein the base portion is made of a en electro-optic crystal made of KTP (Column 4, line 54-Column 5, line 24), but does not specifically disclose that the base portion comprises photonic crystal having a periodic structure. However it is well known in art electro-optic crystals for periodic photonic crystals to be made of KTP for the purpose of forming electro-optic crystalline structures with non-linear properties. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made for the electro-optic device of Kikuchi et al '169 to further comprise the base portion comprising a photonic crystal having a periodic structure since it is well known in art electro-optic crystals for periodic photonic crystals to be made of KTP for the purpose of forming electro-optic crystalline structures with non-linear properties.

Claims 10, 13, and 16-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi et al '169 as applied to independent claim 9 above, in view of Minakata et al US 4,866,406, herein referred to as Minakata et al '406.

Regarding claims 10 and 13, Kikuchi et al '169 discloses an electro-optic modulation device as shown above, but does not specifically disclose that the ridge portion is formed nearly in the center of one side face of the base portion when seen from the direction of the light incidence, or that an insulator covers the ridge portion. Minakata et al '406 teaches of an electro-optic modulation device comprising a ridge portion formed nearly in the center of one side face of the base portion when seen from the direction of the light incidence (Column 8, lines 28-68, wherein the modulator shown in Figure 1 comprises a base portion "1" and a ridge portion "2")

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comprising an electro-optic crystal formed nearly in the center of the base from the light incidence side) wherein the ridge portion is covered by an insulator (Column 8, lines 28-68, wherein the ridge portion "2" is covered by an insulating silicon dioxide layer "3", Figure 1) for the purpose of providing an insulating layer having a smaller refractive index than the optical waveguide to laminate the device in order to reduce dielectric losses (Column 7, lines 57-65 and Column 8, lines 28-68). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made for the electro-optic modulation device of Kikuchi et al '169 to further comprise a ridge portion formed nearly in the center on the one side face of the base portion when seen from the direction of the light incidence, wherein an insulator covers the ridge portion since Minakata et al '406 teaches of an electro-optic modulation device comprising a ridge portion formed nearly in the center on the one side face of the base portion when seen from the direction of the light incidence, wherein the ridge portion is covered by an insulator for the purpose of providing an insulating layer having a smaller refractive index than the optical waveguide to laminate the device in order to reduce dielectric losses.

Regarding claims 16-20, Kikuchi et al '169 discloses an electro-optic modulation device as shown above, but does not specifically disclose that the device comprises a low refractive index medium having a refractive index which is lower than a refractive index of the electro-optic crystal, at least near a side face of the ridge portion located on the base side and included in one pair of side faces other than the one pair of side faces on which the pair of electrodes are formed, wherein an upper portion of the ridge portion comprises the electro-optic material and a lower portion of the ridge or base portion comprises the low refractive index material, wherein the low refractive index medium is electro-optic crystal of similar components to the electro-

optical crystal, but which is lower in refractive index on the basis of a difference in composition ratio. Minakata et al '406 teaches of an electro-optic modulation device comprising a ridge portion as shown above and further teaches that the device comprises a low refractive index medium having a refractive index which is lower than a refractive index of the electro-optic crystal at least near a side face of the ridge portion located on the base side and included in one pair of side faces other than the one pair of side faces on which the pair of electrodes are formed wherein an upper portion of the ridge portion comprises the electro-optic material and a lower portion of the ridge or base portion comprises the low refractive index material (Column 7, line 40-Column 8, line 68, wherein the substrate "1" comprises a material (LiNbO_3) which has a lower refractive index than the material (Ti-diffused LiNbO_3) of optical waveguide crystal section "2", Figure 1), wherein the low refractive index medium is electro-optic crystal of similar components to the electro-optical crystal, but which is lower in refractive index on the basis of a difference in composition ratio (Column 7, line 40-Column 8, line 68, wherein the substrate "1" is made of similar crystal material to the waveguide section "2" yet has a lower refractive index than the optical waveguide crystal section "2", Figure 1) for the purpose of providing an optical waveguide with small dielectric losses (Column 7, lines 57-65 and Column 8, lines 28-68). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made for the electro-optic modulation device of Kikuchi et al '169 to further comprise a low refractive index medium having a refractive index which is lower than a refractive index of the electro-optic crystal, at least near a side face of the ridge portion located on the base side and included in one pair of side faces other than the one pair of side faces on which the pair of electrodes are formed, wherein an upper portion of the ridge portion comprises the

electro-optic material and a lower portion of the ridge or base portion comprises the low refractive index material, wherein the low refractive index medium is electro-optic crystal of similar components to the electro-optical crystal, but which is lower in refractive index on the basis of a difference in composition ratio since Minakata et al '406 teaches of an electro-optic modulation device comprising a ridge portion as shown above and further teaches that the device comprises a low refractive index medium having a refractive index which is lower than a refractive index of the electro-optic crystal at least near a side face of the ridge portion located on the base side and included in one pair of side faces other than the one pair of side faces on which the pair of electrodes are formed wherein an upper portion of the ridge portion comprises the electro-optic material and a lower portion of the ridge or base portion comprises the low refractive index material, wherein the low refractive index medium is electro-optic crystal of similar components to the electro-optical crystal, but which is lower in refractive index on the basis of a difference in composition ratio for the purpose of providing an optical waveguide with small dielectric losses.

Regarding claims 21-24, Kikuchi et al '169 discloses an electro-optic modulation device as shown above, but does not specifically disclose that the device comprises a low refractive index medium in an upper part of the base portion comprises a gas or that the device comprises an adhesive agent located as claimed. Minakata et al '406 teaches of an electro-optic modulation device comprising low refractive index medium in an upper part of the base portion comprising a gas (Column 9, line 44-Column 10, line 35, wherein the gap "7" comprising air is the low refractive index medium in the upper part of the base portion, Figure 6) wherein the device comprises an adhesive agent located as claimed (Column 9, line 44-Column 10, line 35, wherein

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the adhesive agent comprises a buffer layer that acts as a laminate on an upper part of the base portion to bond the electrodes "4" to the substrate "1" as claimed, Figure 6) for the purpose of providing an optical waveguide comprising a buffer layer and an insulating layer with small dielectric losses (Column 7, lines 57-65 and Column 9, line 44-Column 10, line 35). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made for the electro-optic modulation device of Kikuchi et al '169 to further comprises a low refractive index medium in an upper part of the base portion comprising a gas wherein the device comprises an adhesive agent located as claimed since Minakata et al '406 teaches of an electro-optic modulation device comprising low refractive index medium in an upper part of the base portion comprising a gas, wherein the device comprises an adhesive agent located as claimed for the purpose of providing an optical waveguide comprising a buffer layer an insulating layer with small dielectric losses.

Response to Arguments

Applicant's arguments filed April 11, 2007 have been fully considered but they are not persuasive. Specifically, applicant argues that the electrodes of Kikuchi et al '169 (in either embodiment, Figures 2-3 or Figure 5-7) are not formed on the whole top surface of the base portion that is adjacent to the side faces of the ridge portion. The examiner agrees with regards to embodiment of Figures 5-7, however disagrees with respect to the embodiment of Figures 2-3. Specifically, Kikuchi et al '169 discloses that the electrodes are formed on one pair of side faces opposed in a width direction of the ridge portion and on the whole top surface adjacent to the side faces (Column 5, line 26-Column 6, line 39, wherein the electrodes "5" and "3" are formed

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along opposing sides of the crystal "1" in a width direction and cover the exposed top surface of the base portion defined by the groove "8" as shown in Figures 2-3) as shown above.

Additionally, regarding claims 21-23, applicant argues that Minakata et al '406 does not disclose an adhesive agent as claimed. However, the examiner disagrees since Minakata et al '406 teaches of an adhesive agent as claimed (Column 9, line 44-Column 10, line 35, wherein the adhesive agent comprises a buffer layer that acts as a laminate on an upper part of the base portion to bond the electrodes "4" to the substrate "1" as claimed, Figure 6) as shown above.

Allowable Subject Matter

Claims 12 and 14-15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowable subject matter: none of the prior art alone or in combination disclose or teach of the claimed combination of limitations to warrant a rejection under 35 USC 102 or 103.

Specifically regarding claims 12 and 15, none of the prior art alone or in combination disclose or teach of an electro-optic modulation device comprising a ridge portion comprising an electro-optic crystal as claimed, specifically comprising an insulator that covers the whole device.

Specifically regarding claim 14, none of the prior art alone or in combination disclose or teach of an electro-optic modulation device comprising a ridge portion comprising an electro-optic crystal as claimed, specifically comprising an insulator which covers a top surface of the

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ridge portion and side faces of a pair of electrodes which are continuous with the top surface of the ridge portion.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

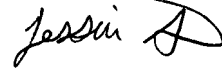
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jessica T. Stultz whose telephone number is (571) 272-2339. The examiner can normally be reached on M-F 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricky Mack can be reached on 571-272-2333. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or ~~571-272-1000~~.



Jessica T Stultz
Examiner
Art Unit 2873
June 18, 2007